Fall 2019

CE 307-101: Geometric Design for Highways

Maaz Choudhry

JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT New Jersey Institute of Technology

CE 307 - Geometric Design for Highways
Section: 101

Fall 2019

Text: Garber, Nicholas, and Hoel, Lester, Traffic and Highway Engineering, 5th Edition, Cengage Learning, 2015, 2009, ISBN-13: 978-1-133-60515-7

Reference Texts: American Association of State Highway Officials A Policy on Geometric Design of Highways and Streets, 4th Edition, (AASHTO) 2001
ISBN# 1-56051-156-7
NJDOT Design Manual-Roadway,
http://www.state.nj.us/transportation/eng/documents/RDM/

Instructor: Professor Maaz Choudhry, P.E., mxc2746@njit.edu
Office Hours: by appointment (Colton 261)

Prerequisite: CE 200, CE 200A. Highway design based on a study of traffic distribution, volume, and speed with consideration for the predictable future. Analysis of elements of at-grade intersections and interchanges and the geometrics of highway design and intersection layout with advanced curve work including compound and transition curves.

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:
http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"*

Date	Topic	Reading	
		Chapter	Pages
9/4	Introduction	1	All
		2	37-49
9/11	Traffic Engineering Studies, Highway Surveys and Locations	4, 14	93-106, 116-133, 729-745, 765-766
9/18	Transportation Planning, Traffic Characteristics	11, 3	All, All
9/25	Traffic Characteristics (cont), Design of the Alignment-Vertical Alignment	3, 15	All, 788-802
10/2	Design of the Alignment – Vertical Alignment (cont)	15	788-802
10/9	Horizontal Alignment	15	802-820
10/16	Horizontal Alignment (cont)	15	802-820
10/23	Review	-	-
10/30	**Exam #1**	-	-
11/6	Intersection Design, Interchange Design	7, Handout	All
11/13	Highway Safety	5	All
11/20	Pavement Management	21	All
12/4	Wrap Up, Review, Discussion on Class Project	-	-
12/11	**Exam #2**	-	-
12/18	**Project Presentations**	-	-

Course Objectives: To develop an understanding of the principles of geometric design in the context of transportation planning and traffic design. To understand the design criteria for geometric design of highways. To develop the capability to design highways.

Grading:

HW	20%
Attendance & Class Participation	10%
Exam #1	20%
Exam #2	20%
Class Project	30%

The final grade will be based upon the following percentages:

A = 90 to 100%
B+ = 85 to 89%
B = 80 to 84%
C+ = 75 to 79%
C = 71 to 74%
D = 68 to 70%
F = below 68%

Important Notes:

* The NJIT Honor Code will be upheld and any violations will be brought to the immediate attention of the Dean of Students.

* Students will be consulted on any substantial changes to the course syllabus. Changes will be discussed and announced in advance.

* There will be no make-up exams.

Description:
A course in highway design based on a study of traffic distribution, volume, and speed with consideration for the predictable future. The elements of at-grade intersections and interchanges are analyzed. Studies are made of highway geometric design and intersection layout with advanced curve work including compound and transition curves.

Prerequisites: CE 200 - Surveying
CE 200A - Surveying Laboratory

Textbook(s)/Materials Required:
Garber, Nicholas, and Hoel, Lester, Traffic and Highway Engineering,
5th Edition, Cengage Learning, 2015, 2009, ISBN-13: 978-1-133-60515-7

Course Objectives:
1. Develop an understanding of the principles of geometric design in the context of transportation planning and traffic design.
2. Understand the design criteria for geometric design of highways.
3. Develop the capability to design highways, and utilize the state of the art tools for this process.

Topics:
Traffic Characteristics
Design of the Alignment – Vertical Alignment
Horizontal Alignment
Cross-Section Elements
Local Roads, Collectors, and Arterials
Intersection Design
Interchange Design
Highway Drainage
Special Topics: Traffic Calming/Context-Sensitive Design

Schedule: Lecture/Recitation- 3 hour class, once per week

Laboratory- none

Professional Component: Engineering Topics (Design)

Program Objectives Addressed: 1, 2

Prepared By: Prof. Daniel Date: 11/21/06

Outcomes Course Matrix – CE 307 Geometric Design for Highways

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Develop an understanding of the basic principles of surveying including the traditional measurements and representations as well as such modern techniques as global positioning.			
Introduce the theory of measurements and related errors.	1	1, 2	Homework, quizzes and exams
Examine aspects of Geographic Information System (GIS) and Global Positioning System (GPS).	7	1, 2	Homework, quizzes and exams
Discuss surveying theory as applied to engineering projects.	1, 2	1, 2	Homework, quizzes and exams
Student Learning Outcome 2: Integrate CAD techniques and tools into the application of basic surveying principles.			
Introduce the theory of mapping and CAD.	1, 7	1, 2	Homework, labs, quizzes and exams
Demonstrate surveying equipment and its proper use.	7	1	Homework, labs, quizzes and exams
Use Geographic Information System (GIS) as a mapping tool.	1, 2, 7	2	Homework, quizzes and exams
Student Learning Outcome 3: Apply the survey database to phases of project control.			
Introduce the control network as a basis for	1	1	Homework, labs, quizzes and exams.

mapping.			
Practice computations associated with route and construction surveys.	1	1	Homework, labs, quizzes and exams.
Combine mapping with CAD.	7	1, 2	Mapping project, quizzes and exams.

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies